

WHAT IS CLAIMED IS:

1. A dielectric reproducing head for reproducing data recorded in a dielectric recording medium, comprising:

5 a probe for applying a high-frequency signal to the dielectric recording medium to detect a nonlinear dielectric constant of a part of the dielectric recording medium located under the probe;

a plurality of bias electrodes placed around the probe, for forming an electric field parallel to a surface of the dielectric recording medium; and

10 a return electrode for returning the high-frequency signal.

2. The dielectric reproducing head according to claim 1, wherein the plurality of bias electrodes make a plurality of bias electrode pairs, two bias electrodes in each of the bias electrode pairs are placed on both sides of the probe respectively, and the probe and the two bias electrodes in each of the bias electrode pairs are arranged in a straight line.

20 3. The dielectric reproducing head according to claim 2, wherein four of the plurality of bias electrodes are placed around the probe at intervals of an angle of 90 degrees.

4. The dielectric reproducing head according to claim 2, further comprising an alternating current voltage generation device for generating a plurality of alternating current voltages each having

different phase from the others, and applying the plurality of alternating current voltages to the plurality of bias electrode pairs respectively.

5 5. The dielectric reproducing head according to claim 3, further comprising an alternating current voltage generation device for generating a plurality of alternating current voltages which are different in phase from each other by 90 degrees, and applying the plurality of alternating current voltages to the plurality of bias  
10 electrode pairs respectively.

6. The dielectric reproducing head according to claim 1, wherein the probe detects the nonlinear dielectric constant of a part of the dielectric recording medium located under the probe by using a  
15 scanning nonlinear dielectric microscopy method;

7. A dielectric recording head for recording data in a dielectric recording medium, comprising:

a probe; and

20 a plurality of bias electrodes placed around the probe, for forming an electric field parallel to a surface of the dielectric recording medium by generating a voltage corresponding to the data between any one of the plurality of bias electrode and the probe.

25 8. The dielectric recording head according to claim 7, wherein the plurality of bias electrodes make a plurality of bias electrode

pairs, two bias electrodes in each of the bias electrode pairs are placed on both sides of the probe respectively, and the probe and the two bias electrodes in each of the bias electrode pairs are arranged in a straight line.

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9. The dielectric recording head according to claim 8, wherein four of the plurality of bias electrodes are placed around the probe at intervals of an angle of 90 degrees.

10 10. A dielectric reproducing apparatus for reproducing data recorded in a dielectric recording medium, comprising:

a dielectric reproducing head comprising (i) a probe for applying a high-frequency signal to the dielectric recording medium to detect a nonlinear dielectric constant of a part of the dielectric recording medium located under the probe, (ii) a plurality of bias electrodes placed around the probe, for forming an electric field parallel to a surface of the dielectric recording medium, and (iii) a return electrode for returning the high-frequency signal;

an alternating current signal generating device for generating an alternating current signal to be applied to the plurality of bias electrodes of the dielectric reproducing head to form the electric field;

an oscillating device for generating the high-frequency signal to be applied to the probe;

a demodulating device for demodulating the high-frequency signal including a signal component corresponding to the nonlinear dielectric constant detected by the probe; and

a data reproducing device for reproducing the data on the basis of the demodulated high-frequency signal and the alternating current signal.

5 11. The dielectric reproducing apparatus according to claim 10, wherein the data reproducing device reproduces the data by using coherent detection.

12. The dielectric reproducing apparatus according to claim 11,  
10 wherein the data reproducing device is a lock-in amplifier.

13. A dielectric recording apparatus for recording data in a dielectric recording medium, comprising:

a dielectric recording head comprising (i) a probe and (ii) a  
15 plurality of bias electrodes placed around the probe, for forming an electric field corresponding to the data parallel to a surface of the dielectric recording medium;

a recording signal generating device for generating a recording signal corresponding to the data; and

20 a signal applying device for applying the recording signal between the probe and any one of the plurality of bias electrodes to form the electric field corresponding to the data.

14. A dielectric recording / reproducing apparatus for recording  
25 data in a dielectric recording medium and for reproducing data recorded in the dielectric recording medium, comprising:

a dielectric recording / reproducing head comprising (i) a probe, (ii) a plurality of bias electrodes placed around probe, (iii) a return electrode placed near the probe;

an oscillating device for generating a high-frequency signal to  
5 be applied between the probe and the return electrode, in order to detect a nonlinear dielectric constant of a part of the dielectric recording medium located under the probe through the probe;

an alternating current signal generating device for generating  
an alternating current signal to be applied to the plurality of bias  
10 electrodes, in order to form an electric field in the dielectric recording medium;

a demodulating device for demodulating the high-frequency  
signal including a signal component corresponding to the nonlinear  
dielectric constant of a part of the dielectric recording medium  
15 located under the probe;

a data reproducing device for reproducing the data on the  
basis of the demodulated high-frequency signal and the alternating  
current signal;

a recording signal generating device for generating a  
20 recording signal corresponding to the data to be recorded; and

a signal applying device for applying the recording signal  
between the probe and any one of the plurality of bias electrodes.

15. The dielectric recording / reproducing apparatus according to  
25 claim 14, wherein the data reproducing device reproduces the data by using coherent detection.

16. The dielectric recording / reproducing apparatus according to claim 15, wherein the data reproducing device is a lock-in amplifier.